User 3

Base Station

User 2

User 1

Figure 1A

$b_1[m]$

$A_1,\ \tau_1$

$s_1(t-mT_b)$

$b_2[m]$

$A_2,\ \tau_2$

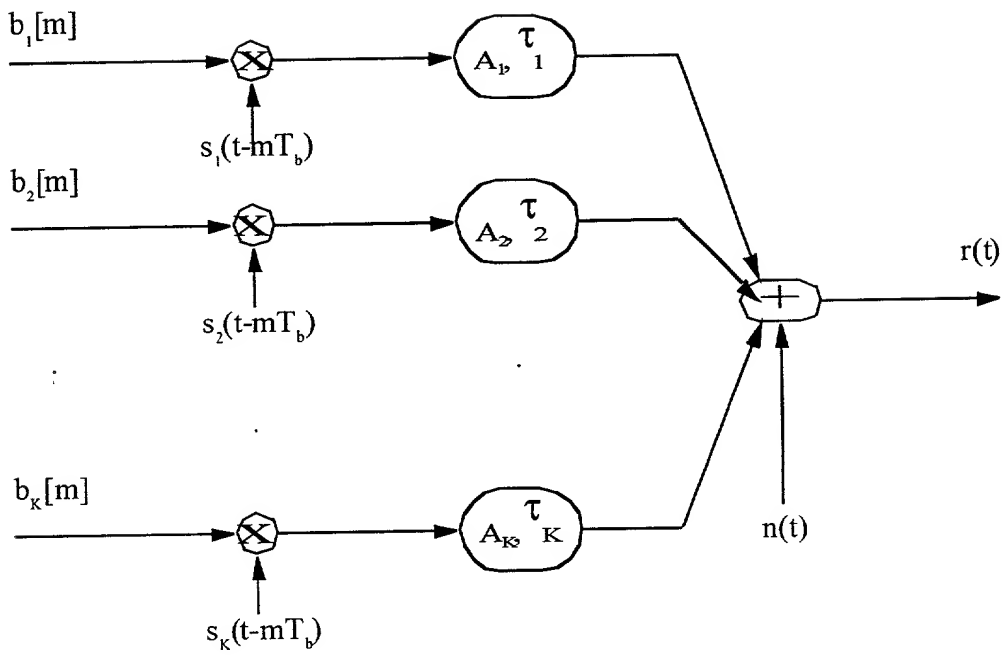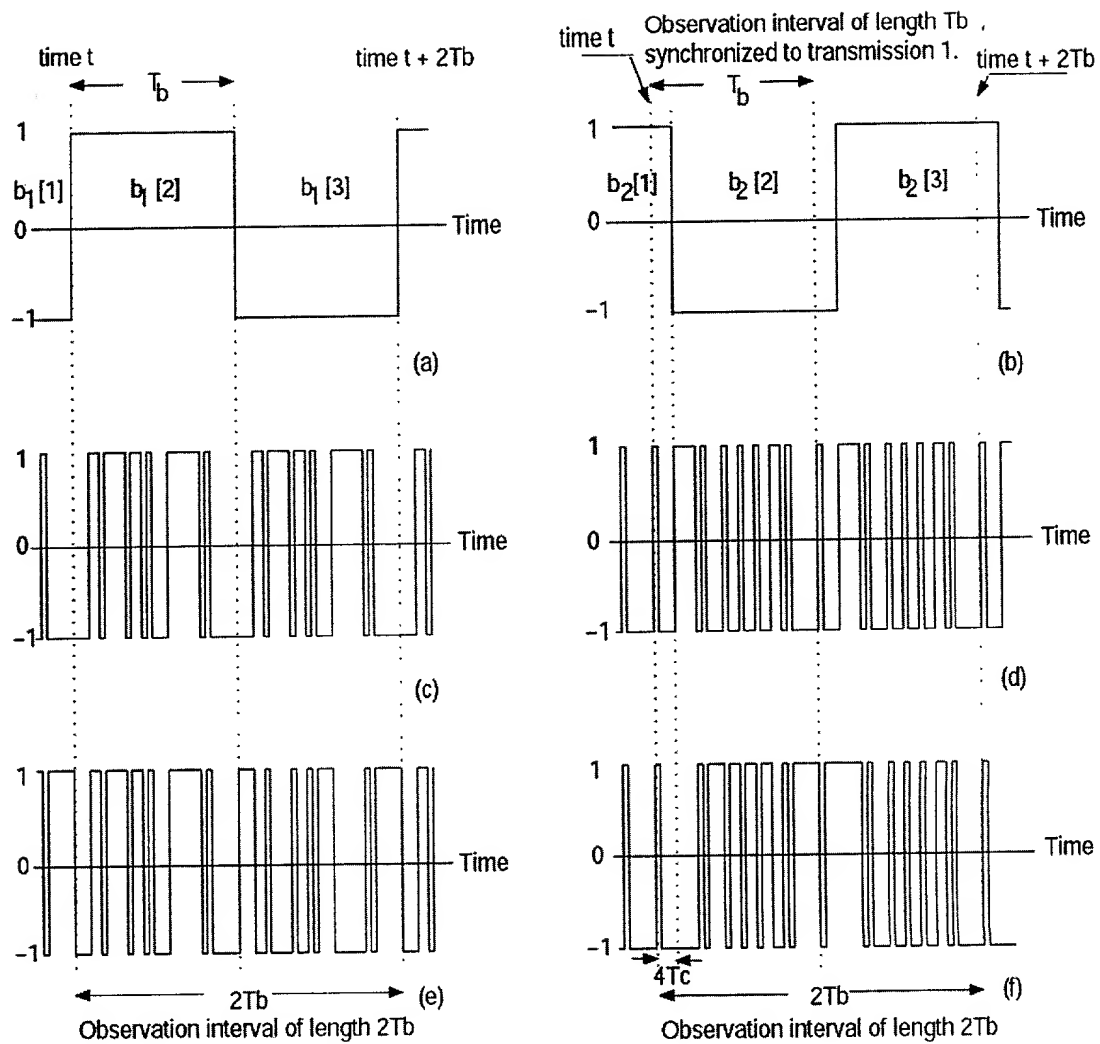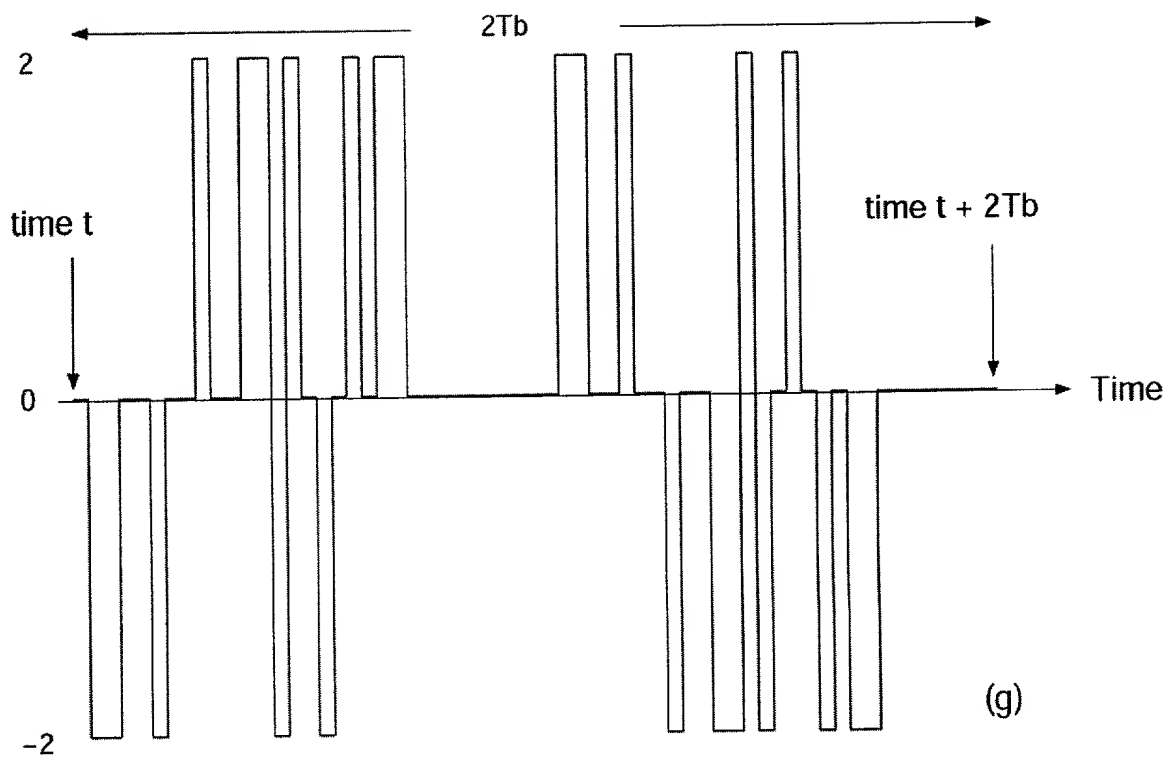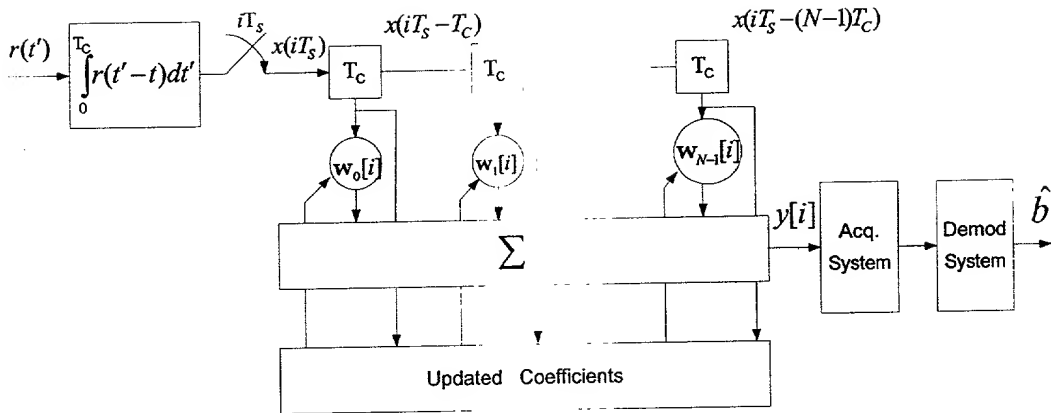$s_2(t-mT_b)$

$b_K[m]$

$A_K,\ \tau_K$

$s_K(t-mT_b)$

$n(t)$

$r(t)$

Figure 1

Figure 2a – 2f

Figure 2g

Figure 3

Figure 4

Figure 5

| x(iTs) | x(iTs - Tc) | - - - - | x(iTs - (N-1)Tc) | **X**[i] |

| x((i-1)Ts) | x((i-1)Ts - Tc) | - - - - | x((i-1)Ts - (N-1)Tc) | **X**[i-1] |

$\vdots$

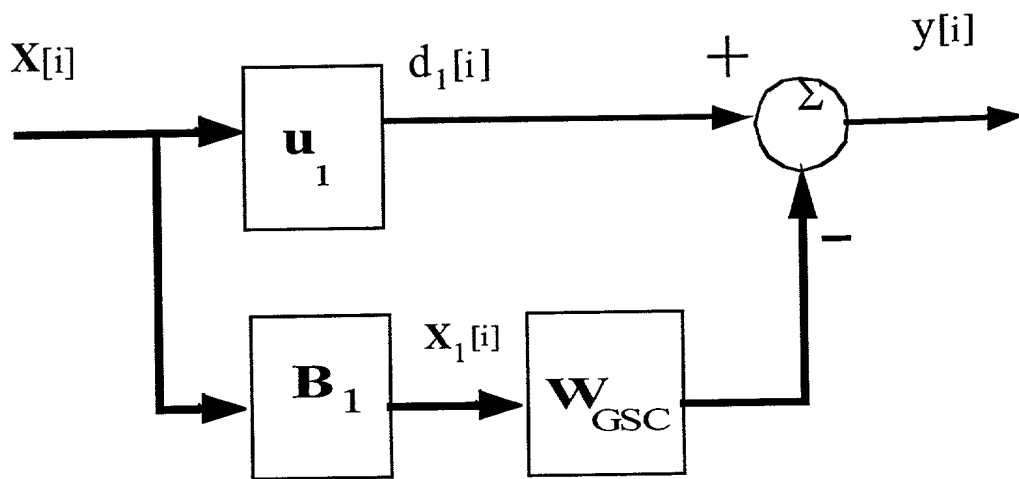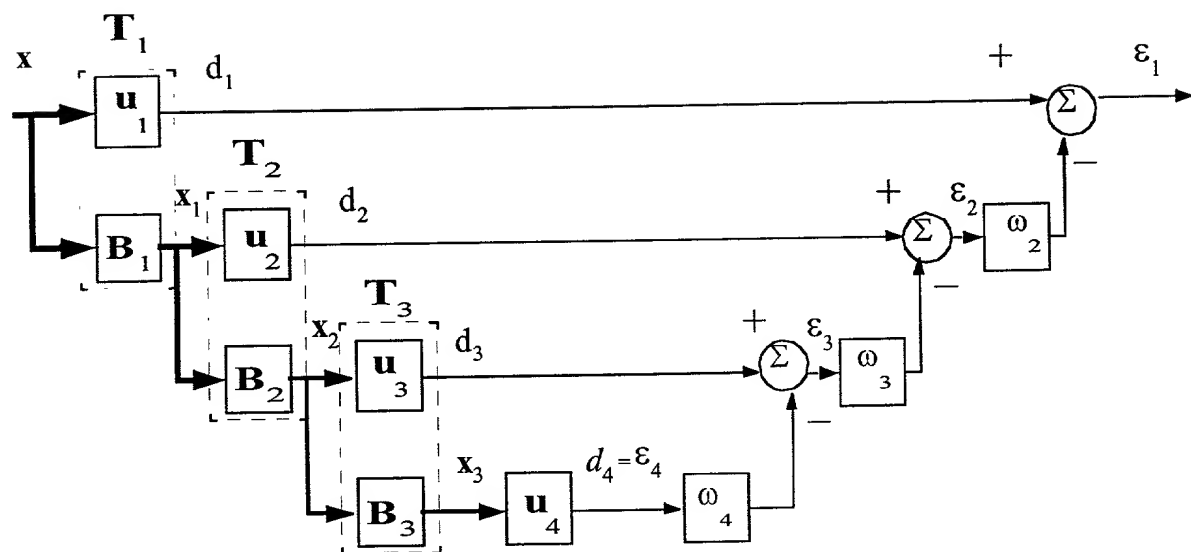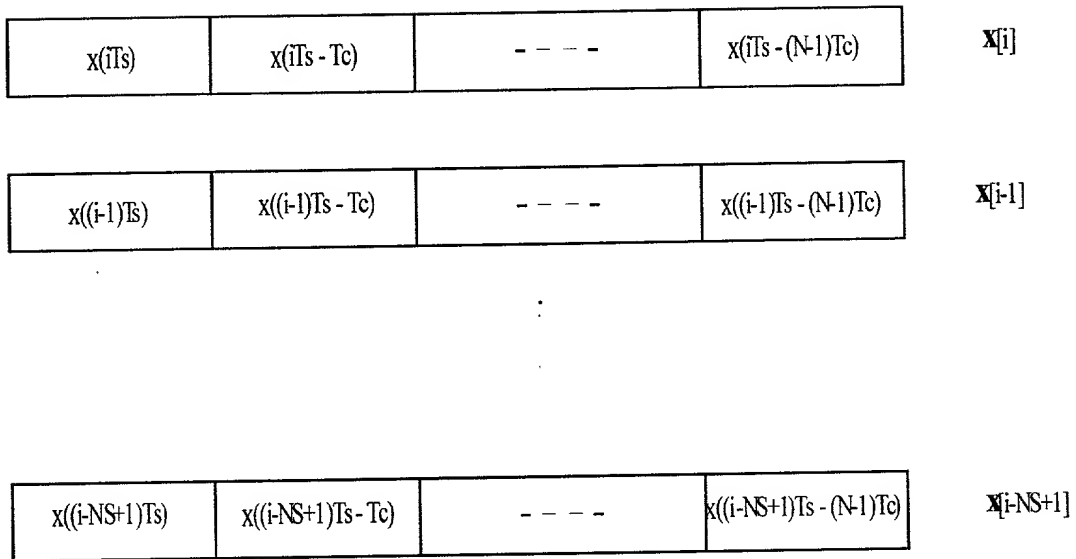| x((i-NS+1)Ts) | x((i-NS+1)Ts - Tc) | - - - - | x((i-NS+1)Ts - (N-1)Tc) | **X**[i-NS+1] |
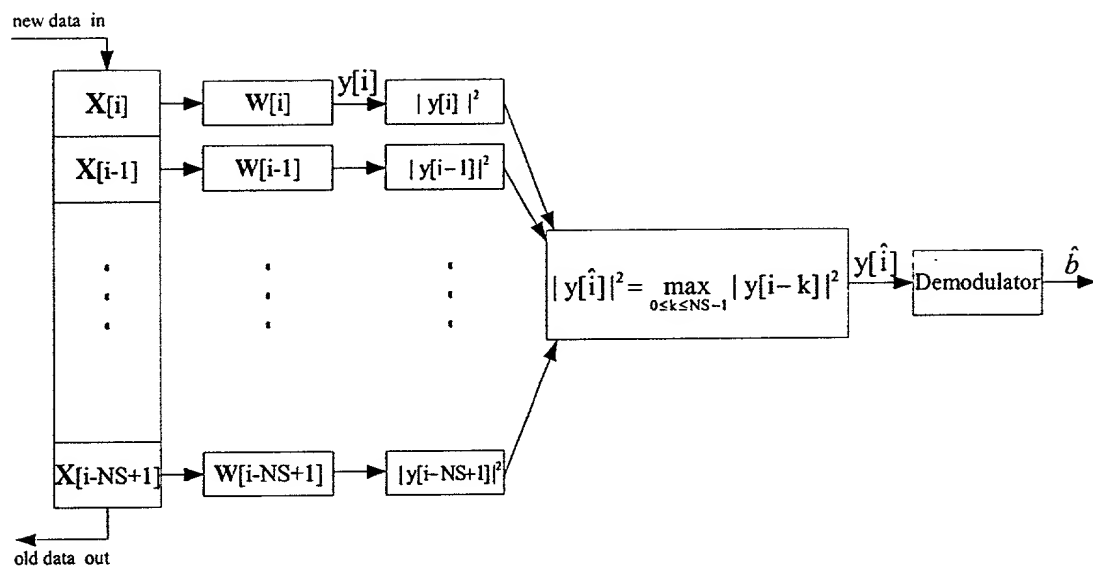
Figure 6

Figure 7: Block diagram of synchronization detector

Figure 8

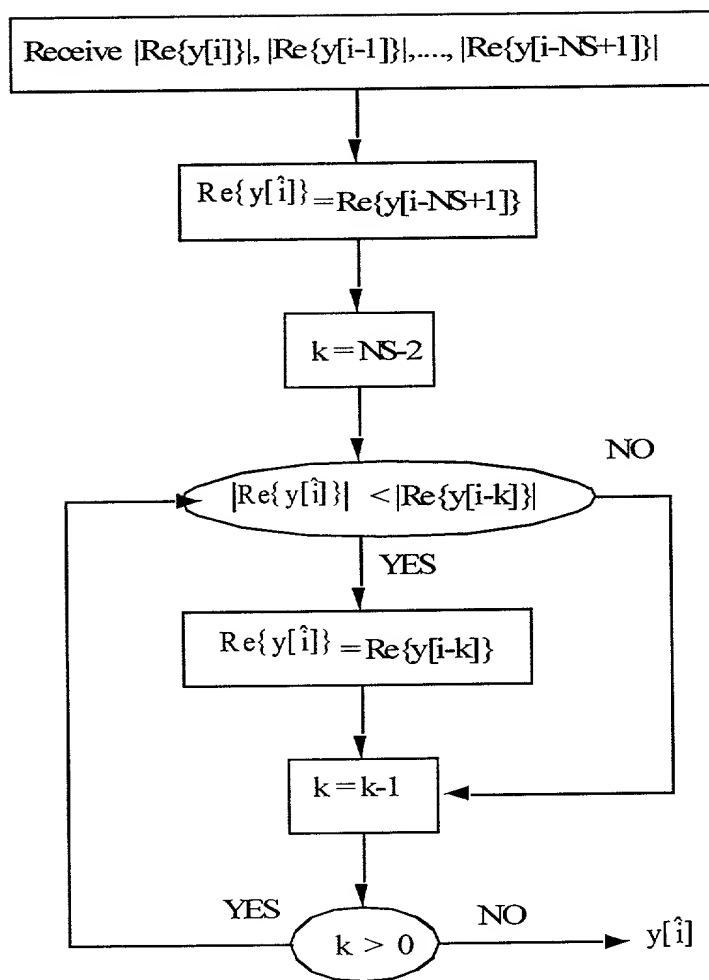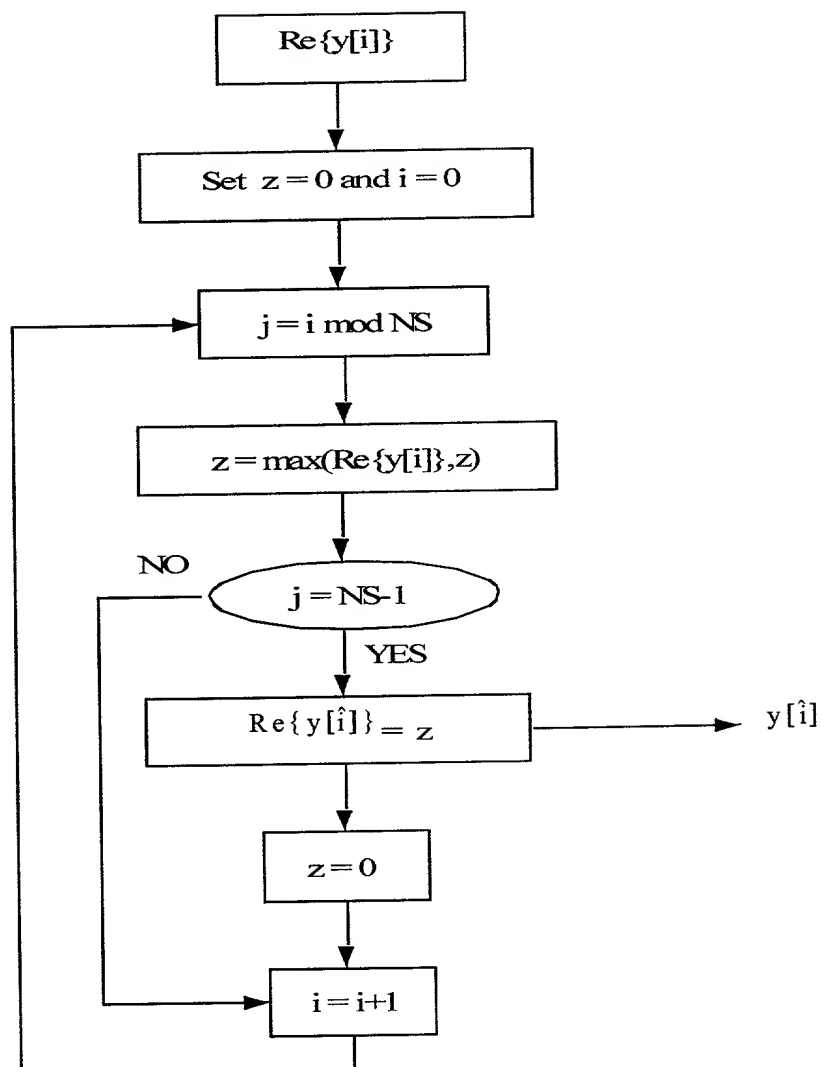Receive $|Re\{y[i]\}|$, $|Re\{y[i-1]\}|$,...., $|Re\{y[i-NS+1]\}|$

$Re\{y[\hat{i}]\} = Re\{y[i-NS+1]\}$

$k = NS-2$

$|Re\{y[\hat{i}]\}| < |Re\{y[i-k]\}|$

NO

YES

$Re\{y[\hat{i}]\} = Re\{y[i-k]\}$

$k = k-1$

YES

$k > 0$

NO

$y[\hat{i}]$

Figure 9

```
        ┌─────────────────────┐
        │      Re{y[i]}       │
        └─────────────────────┘
                  │
                  ▼
     ┌───────────────────────────┐
     │    Set  z = 0 and i = 0    │
     └───────────────────────────┘
                  │
                  ▼
  →  ┌───────────────────────────┐
  │  │       j = i mod NS        │
  │  └───────────────────────────┘
  │               │
  │               ▼
  │  ┌───────────────────────────┐
  │  │    z = max(Re{y[i]},z)    │
  │  └───────────────────────────┘
  │               │
  │          NO   ▼
  │      ┌──────────────────┐
  │  ◄───│     j = NS-1      │
  │      └──────────────────┘
  │               │ YES
  │               ▼
  │  ┌───────────────────────────┐
  │  │     Re{y[î]} = z          │─────────►  y[î]
  │  └───────────────────────────┘
  │               │
  │               ▼
  │        ┌──────────────┐
  │        │     z = 0    │
  │        └──────────────┘
  │               │
  │               ▼
  │        ┌──────────────┐
  └────────│    i = i+1   │◄────
           └──────────────┘
```
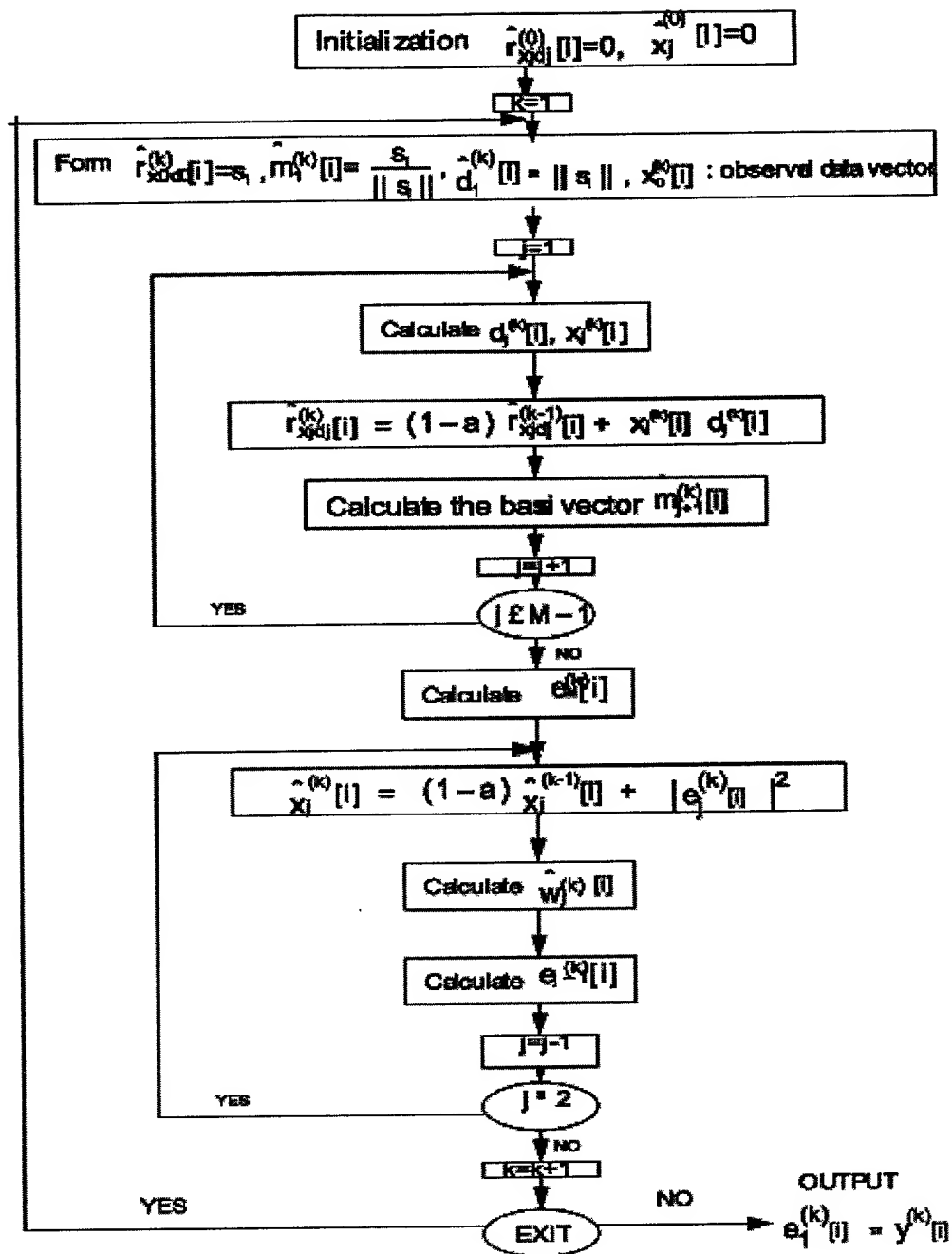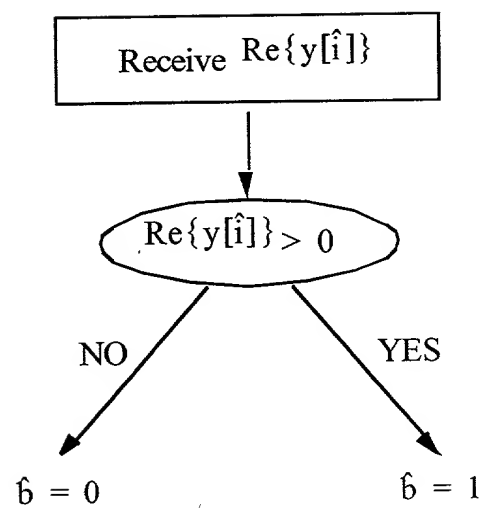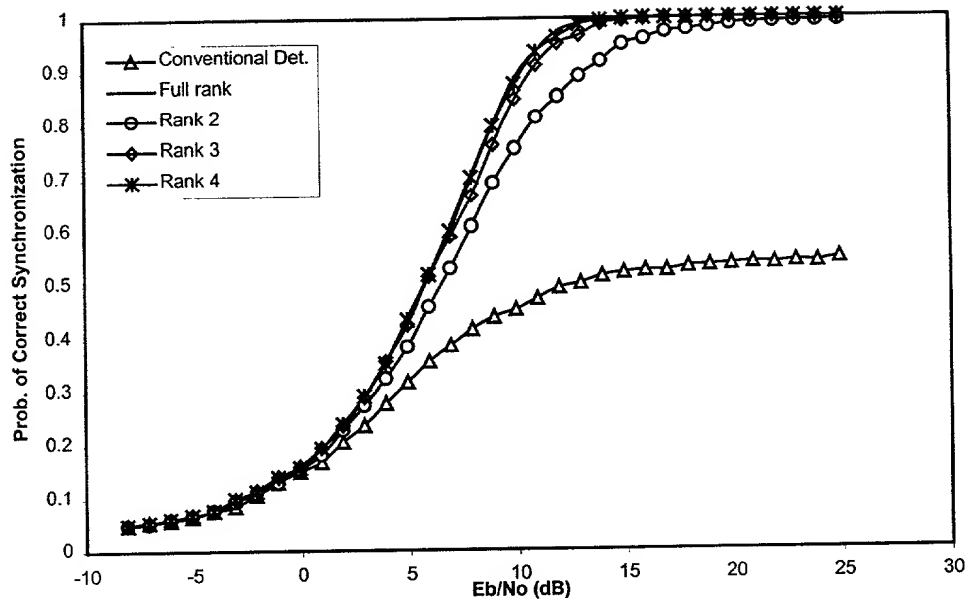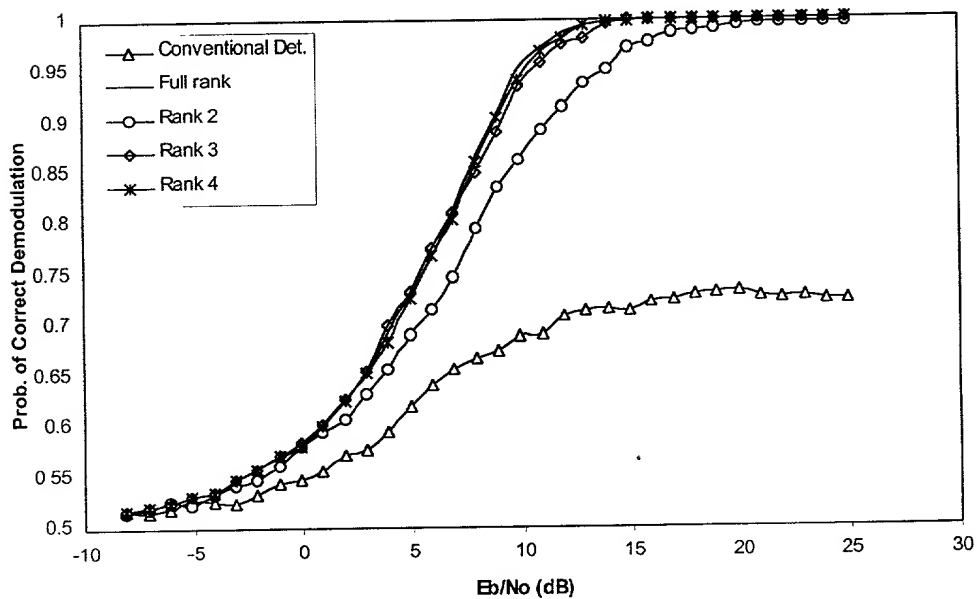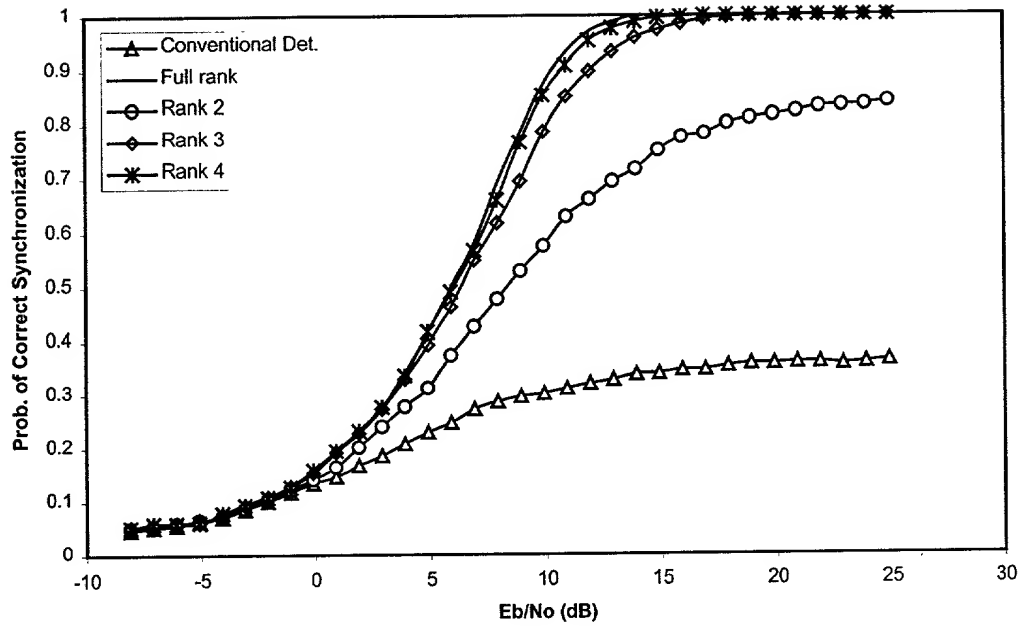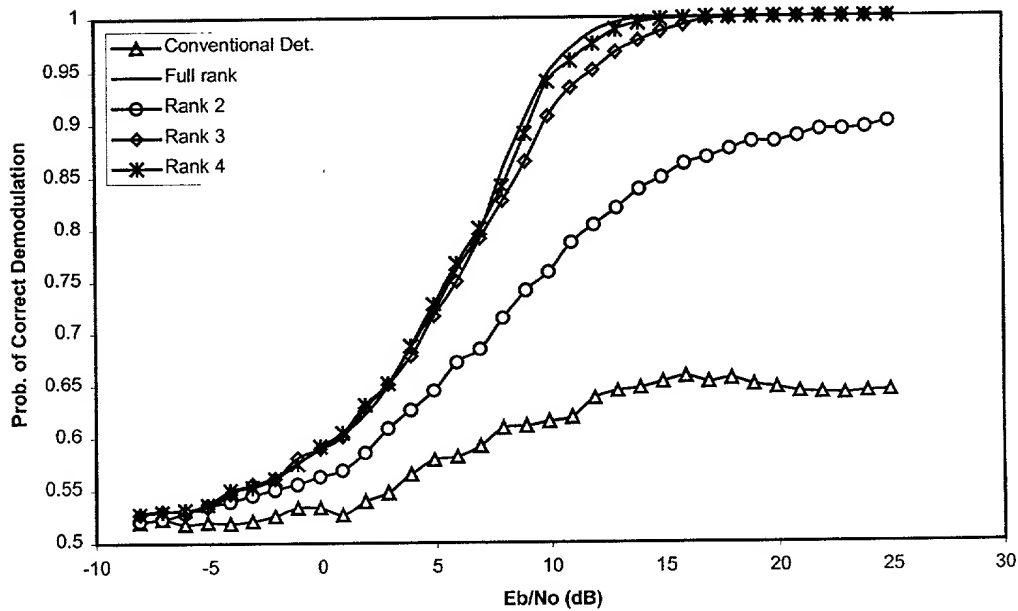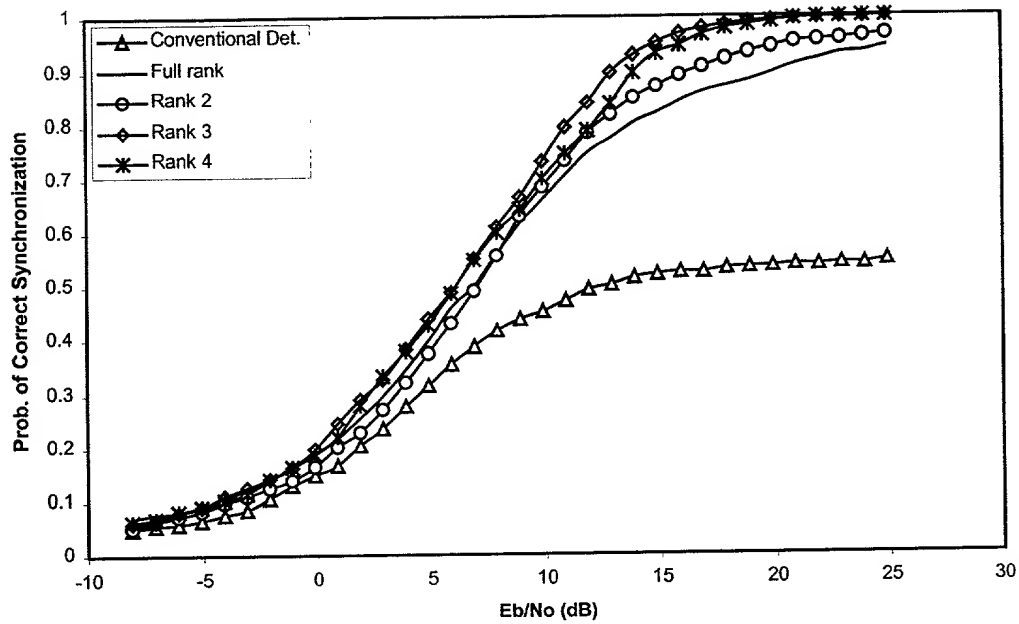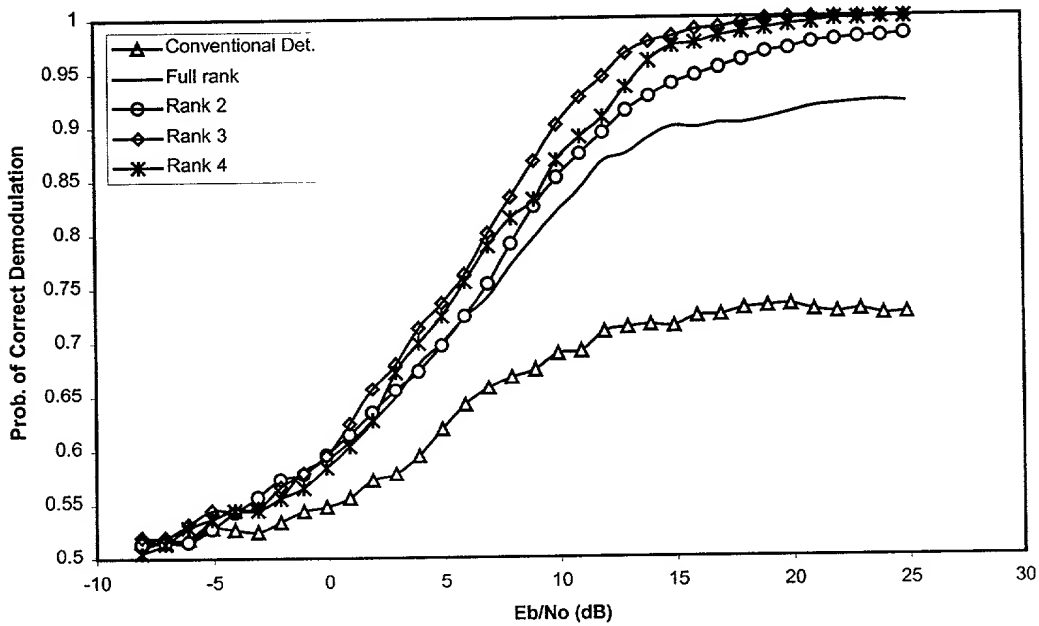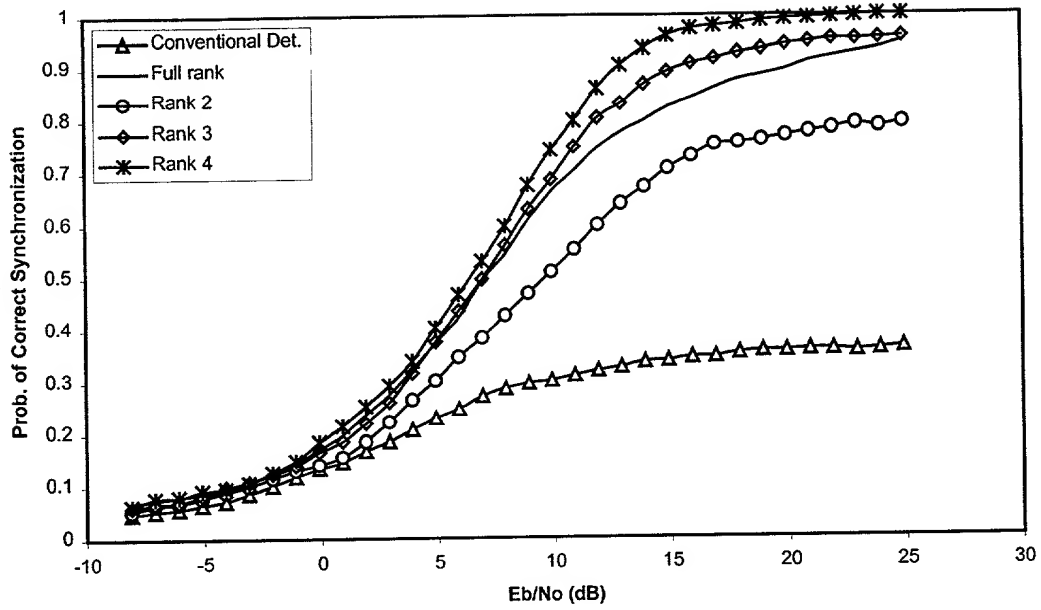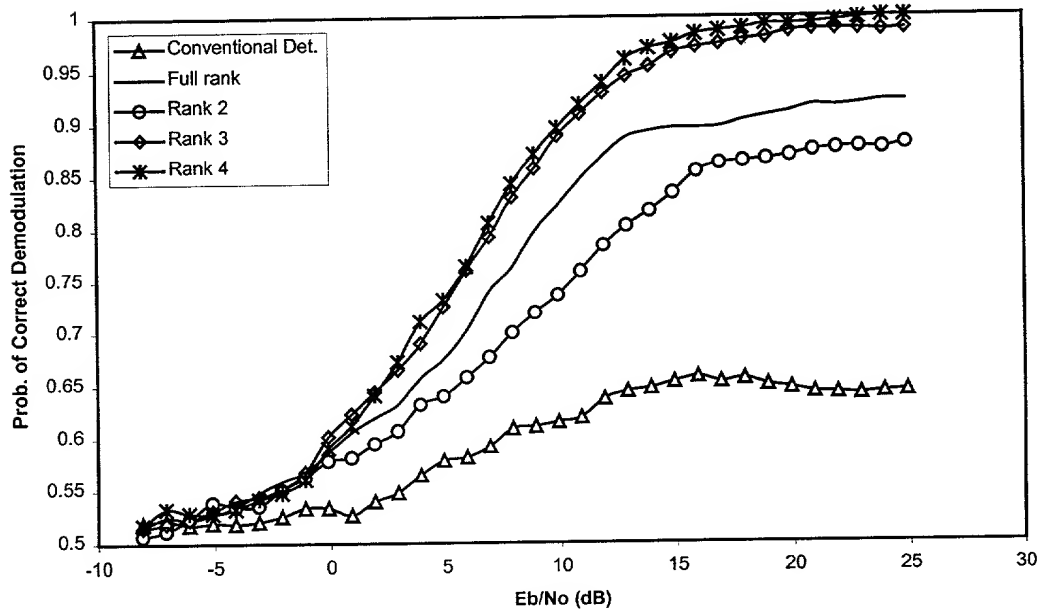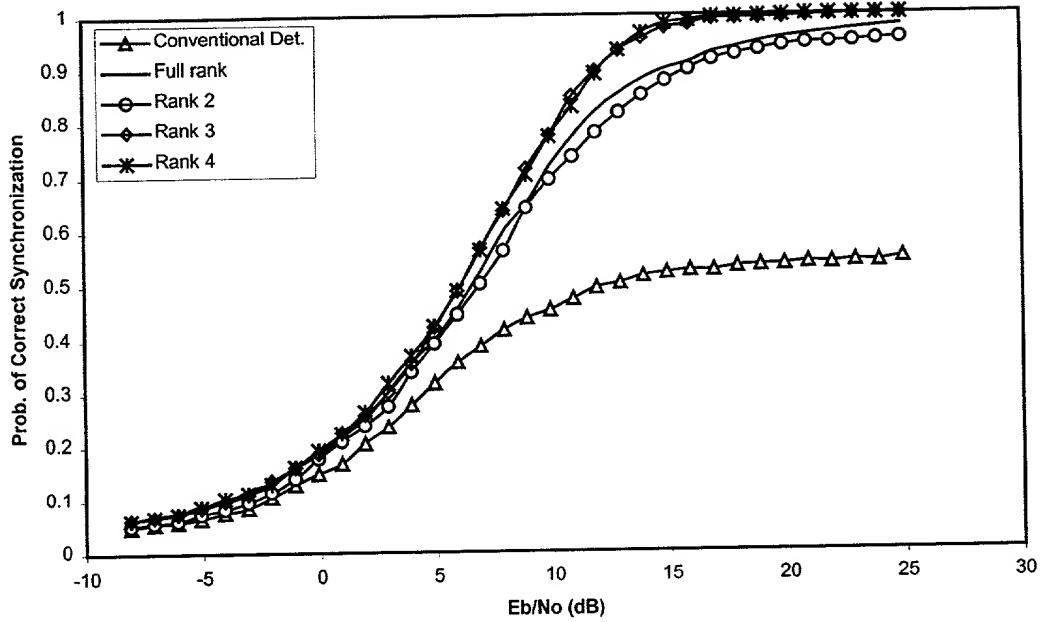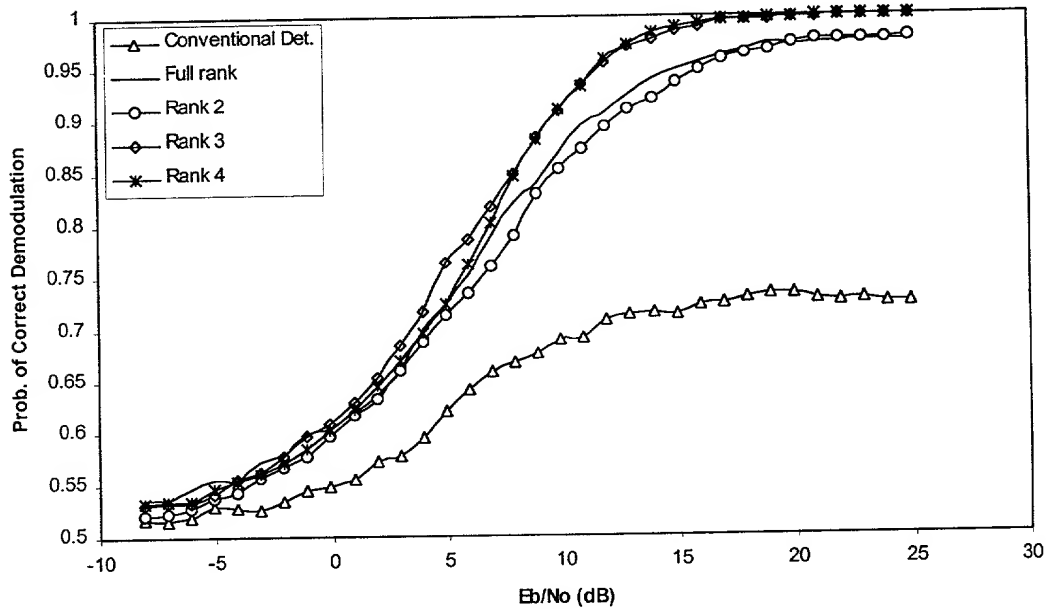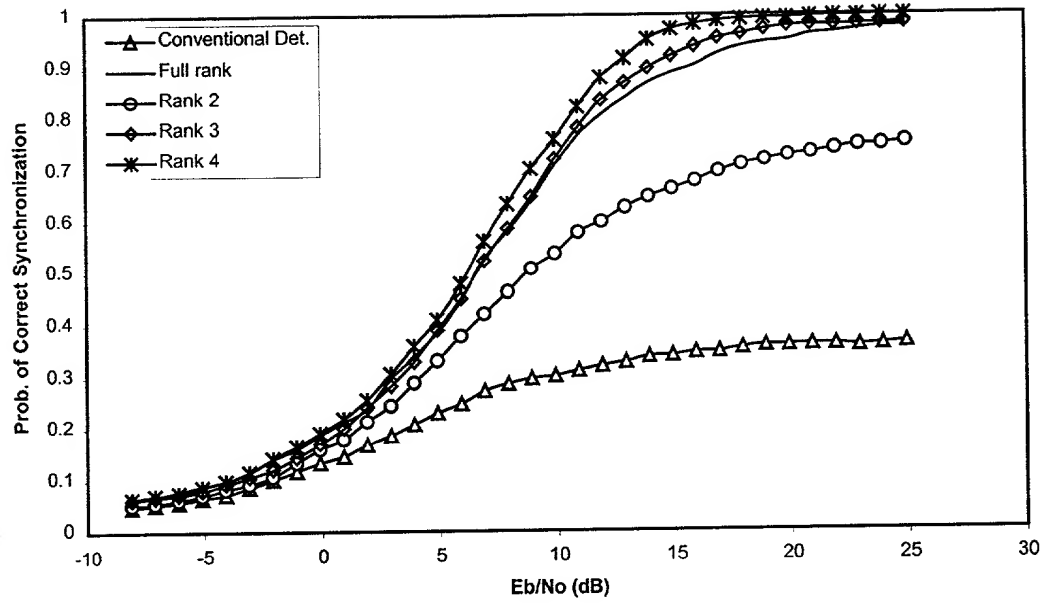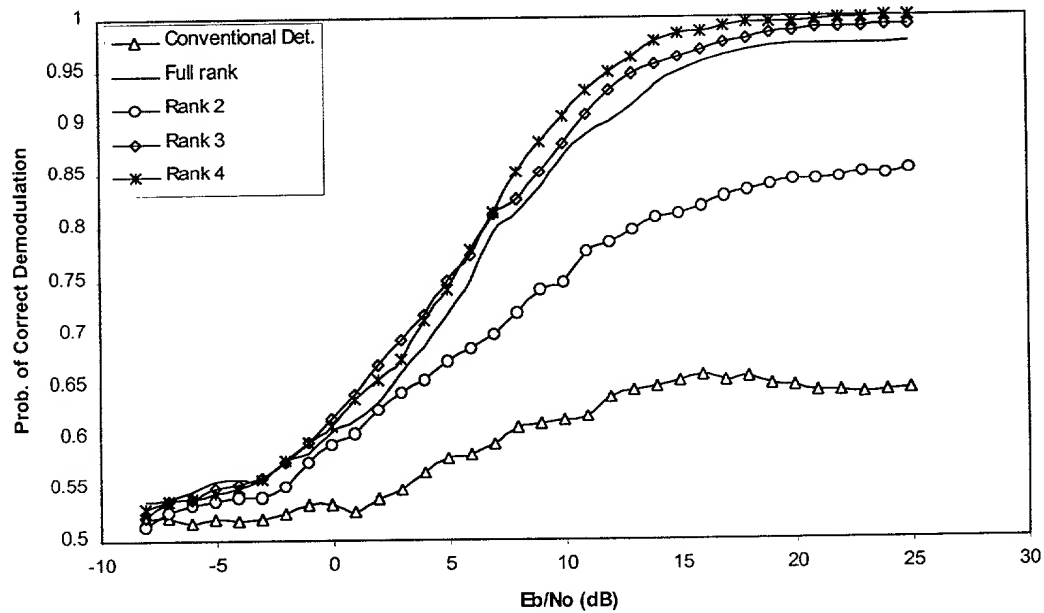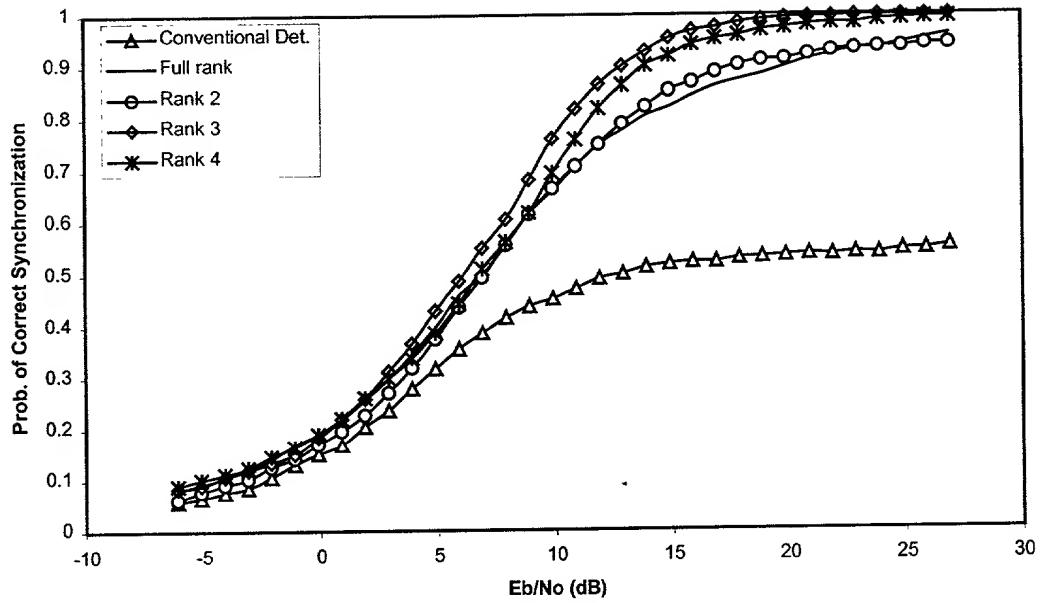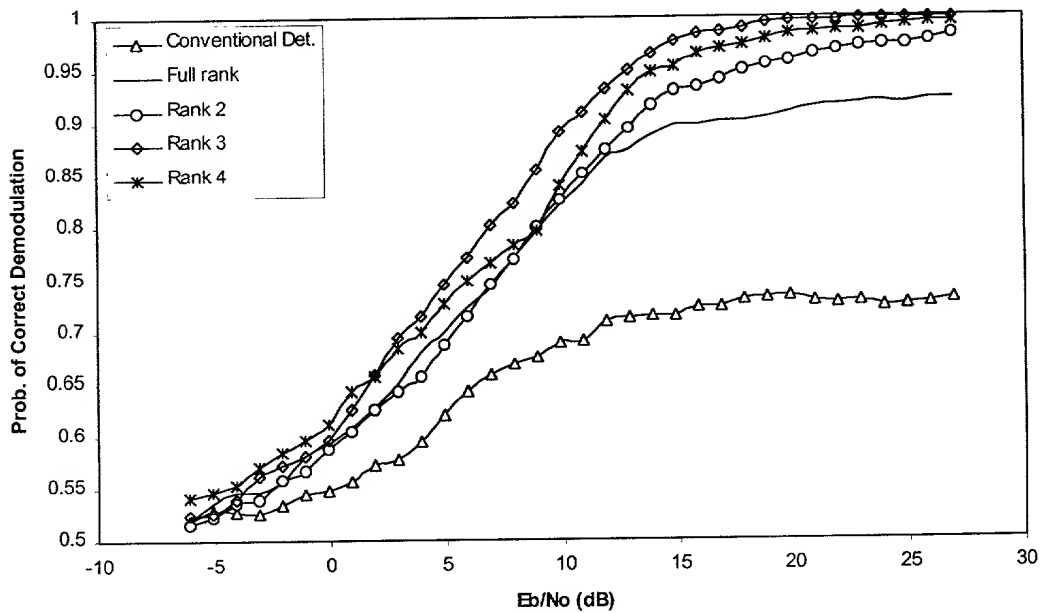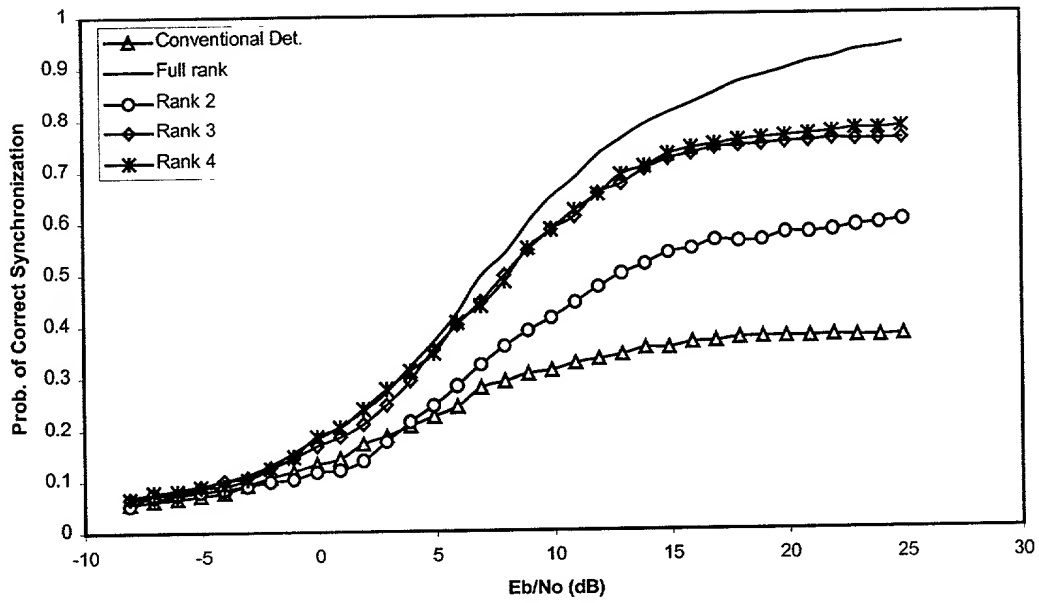
Figure 9A

Figure 10

Figure 11a

Figure 11b

Figure 12a

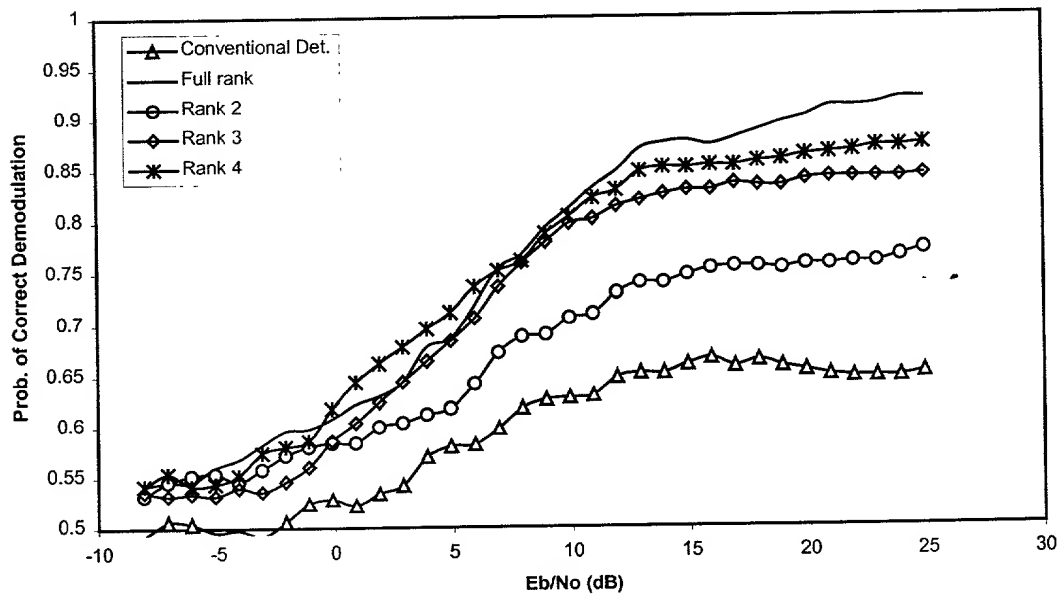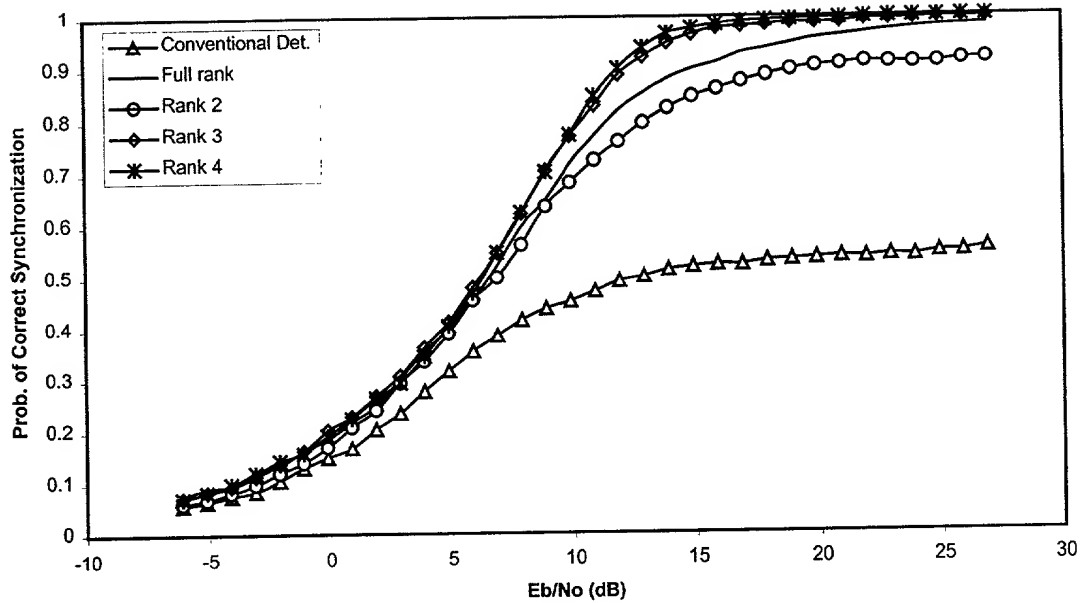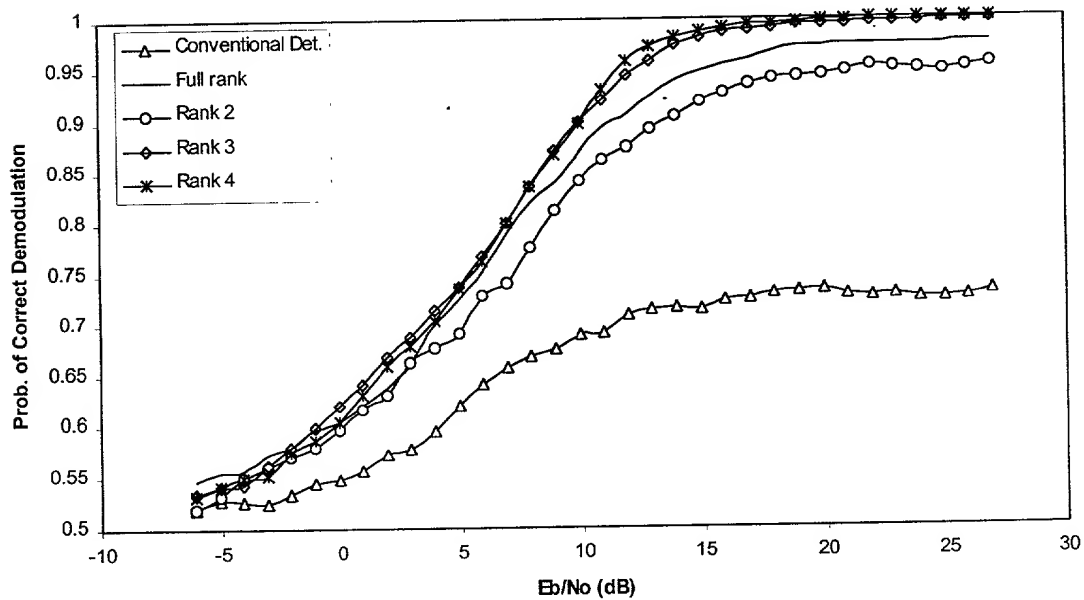Figure 12b

Figure 13a

Figure 13b

Figure 14a

Figure 14b

Figure 15a

Figure 15b

Figure 16a

Figure 16b

Figure 17a

Figure 17b

Figure 18a

Figure 18b

Figure 19a

Figure 19b

Figure 20a

Figure 20b